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## 324 SODIUM REMOVAL PILOT PLANT

## 1.0 INTRODUCTION

## 1.1 Purpose

The purpose of this synopsis is to support the request for withdrawal by the U. S. Department of Energy-Richland Operations Office (DOE-RL) and Pacific Northwest Laboratories (PNL) of the Washington State Hazardous Waste Management Act (Chapter 70.105 RCW) Part A and Part B Permit Applications for the 324 Sodium Removal Pilot Plant. Information presented below will justify the withdrawal of the permit applications for the 324 Sodium Removal Pilot Plant. There are no current plans to treat dangerous or mixed waste at this facility.

## 1.2 Previous Application Submittal

The initial Part A permit application was submitted to the Washington State Department of Ecology by DOE-RL on November 1, 1985. On July 1, 1987, as a result of Hanford consolidation, the responsibility for the 324 Sodium Removal Pilot Plant was transferred from Westinghouse Hanford Company to PNL. The Part A permit was resubmitted without change on May 19, 1988. The Part B Permit Application was submitted on November 7, 1985.

The original Part A permit application was submitted as a protective filing based on the possibility that sodium waste might be brought to the facility for treatment in the future. This did not occur and PNL has no intent to operate the facility for that purpose.

## 2.0 FACILITY DESCRIPTION

The pilot plant is located in room 146 within the Chemical Materials Engineering Laboratory, Building 324, inside the 300 Area of the Hanford Site. The plant was originally built to develop and demonstrate processes for sodium removal.

The 324 Sodium Removal Pilot Plant consists of a reaction vessel and associated nitrogen and steam supply system with added features for decontamination studies. The pilot plant occupies part of the high bay area; the plant is served by a mezzanine, overhead crane, pressure vessels, plumbing and, other equipment essential to operating the sodium cleaning operations (Figure D-1).

## 3.0 PROCESS INFORMATION

## 3.1 Operations History

Since the early 1970's, the 324 Sodium Removal Pilot Plant was used as a cleaning and decontamination facility for materials contaminated with small amounts of alkali metals. Until 1983, the 324 Pilot Plant was also used to

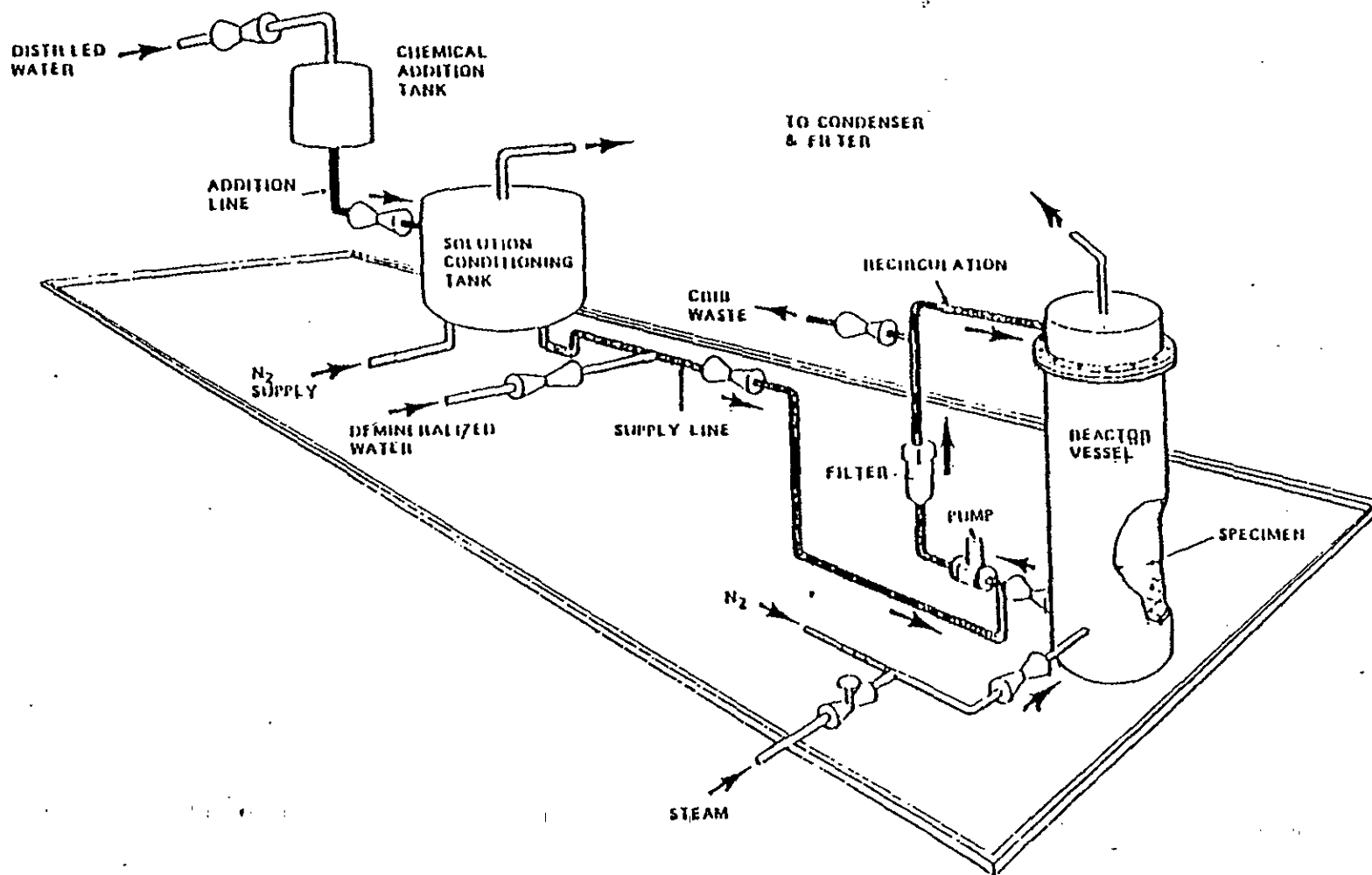


Figure D-1. 324 Sodium Pilot Plant System Design

treat small amounts of radioactive alkali metals for research and process development.

After 1983 the facility was only used to clean and decontaminate test equipment, reactor components, and reusable parts contaminated with sodium. Some of the sodium was also radioactively contaminated with small quantities of  $^{22}\text{Na}$ ,  $^{134}\text{Cs}$ , and  $^{137}\text{Cs}$ . Inside pressurized vessels, in an argon-nitrogen atmosphere, the sodium is cleaned by reaction with steam creating sodium hydroxide. This material was then neutralized before disposal at Hanford. Under some circumstances sodium was removed, repackaged, and reused and the equipment cleaned as stated above.

### 3.2 Waste Designation

A regulatory analysis was performed on the cleaning and decontamination of sodium-wetted parts by Westinghouse Hanford Company. This analysis concluded cleaning and decontamination of sodium-wetted parts does not constitute a treatment activity under the Dangerous Waste Regulations. Cleaning and decontamination operations are not considered waste management activities. The sodium that was reacted was attached to parts and equipment which had to be cleaned of sodium before equipment reuse. This cleaning is not part of the definition of treatment. The definition is "the physical, chemical, or biological processing of dangerous waste to make such waste nondangerous or less dangerous, safer for transport, amenable for energy or material resource recovery, amenable for storage, or reduced in volume" [Washington Administrative Code (WAC) 173-303-040].

The sodium hydroxide formed during the cleaning operations would be dangerous waste, if the pH exceeded 12.5, due to its corrosive characteristics as defined in WAC 173-303-090. However, neutralization of the sodium hydroxide is considered "elementary neutralization" and qualifies for a "permit by rule" described in WAC 173-303-802.

### 4.0 SUMMARY

This facility qualifies for withdrawal of the permit applications because only alkali metal cleaning and decontamination operations are conducted at the 324 Sodium Removal Pilot Plant. Treatment conducted before 1983 was for research and process development and was conducted on small amounts of radioactive alkali metals.

Alkali metals cleaned from materials cause sodium hydroxide solution to be formed. The sodium hydroxide solution is then neutralized. No releases to the environment have occurred from the 324 Sodium Removal Pilot Plant. The pilot plant is in room 146 within the 324 building and no work has been conducted outside of this controlled area.

### 5.0 CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons directly

*✓ Not necessary 011 - (11)  
Can you show us that treatment does per norm 100 below  
the treatment already cleaning of*

*what about waste*

*George J. Emmerle*

responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

\_\_\_\_\_  
William R. Wiley, Director  
Pacific Northwest Laboratories

\_\_\_\_\_  
Date

\_\_\_\_\_  
Michael J. Lawrence, Manager  
U.S. Department of Energy  
Richland Operations Office

\_\_\_\_\_  
Date

ADDITIONAL INFORMATION REQUESTED FOR  
324 PILOT PLANT WITHDRAWAL REQUEST

As requested in the Washington State Department of Ecology letter of August 17, 1989, the following additional information is provided to support the Part A permit application withdrawal for the 324 Pilot Plant. Responses to specific requests are summarized below.

Request 1: A complete description of the use of the solution conditioning tank.

The purpose of the solution conditioning tank, in conjunction with the main sodium vessel, was to determine the effectiveness of the pilot plant at removing (i.e., decontaminating) radioactivity from sodium-wetted hardware via a four-step process. It should be noted that the solution conditioning tank was only used during a small percentage of pilot plant campaigns; i.e., it was used only when the research objectives included identifying the quantity of radioactivity removed.

The following process steps describe how the tank was used.

Step 1. The process started by filling the solution conditioning tank with deionized water and adding citric and glycolic (hydroxiacetic) acids (common decontamination agents) to make a 2.5% solution.

Step 2. Test coupons contaminated with radioactivity were wetted with sodium, were then placed in the main vessel where the sodium was removed with the water vapor-nitrogen process.

Coupons were small (one to several inches square) pieces of metal from pumps and vessels proposed for use in breeder programs.

Step 3. To remove the radioactivity from the coupon, decontamination solution from the solution conditioning tank was then pumped into the main vessel to remove the radioactivity from the coupons.

Step 4. The coupons were then removed from the main vessel and tested to determine the effectiveness of steps 2 and 3.

As can be seen from the description of the process, the tank was a chemical makeup tank and was not used in direct contact with sodium- and/or radioactively-contaminated parts.

Request 2: Further description of the use of this facility during the 1980-1983 time period. This should include all documentation necessary to support the petition withdrawal (i.e., log books, etc.).

The laboratory record books (LRBs) that describe the operations of the 324 Sodium Pilot Plant are available for your inspection at any time. We have summarized the entries in the LRBs during the time period requested (see

Table 1.1. In instances where log entries were unclear, we interviewed operating personnel who were still onsite.

It should be noted that during 1980-1983, the plant was operated by the Stanford Engineering Development Laboratory, which was subsequently consolidated with PNL on July 1, 1987.

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TABLE 1. Chronology of the SCA Pilot Plant Operations, 1980 Through 1981.

- JANUARY 1, 1980-MARCH 10, 1981: no activity
  - MARCH 11, 1981: first run of the wetting station. Four "crevice blocks" and one "handling socket" were cleaned (i.e, the sodium was removed).
  - (a) APRIL 15-17, 1981: second run of the wetting station. A potential helium leak was checked. Four crevice blocks, one handling socket, and a screen cylinder were cleaned.
  - APRIL 22-24, 1981: thirty, small, tensile specimens were wetted with sodium for future cleaning tests.
  - APRIL 27-MAY 7, 1981: an SCA subassembly simulated the hydraulics of a fuel assembly and was cleaned (SCA is similar to a fuel assembly but it is nonnuclear and has a filter/particle trap to capture debris left over from construction). Decontamination is different from cleaning. Decontamination is the removal of deposited radioactivity using a mild acid process. The acid for this activity was mixed in the solution conditioning tank. Filter/particle traps(9) were also cleaned.
  - MAY 15, 1981: filter and debris (from the SCA cleaning) were dried and weighed.
  - MAY 14-20, 1981: SCA cleaning run #2; 9 subassemblies were cleaned.
  - MAY 29-JUNE 5, 1981: SCA run #3; 9 subassemblies were cleaned.
  - JUNE 9-17, 1981: SCA run #4; 19 filter/particle traps were cleaned.
  - JUNE 18-29, 1981: SCA run #5; 9 subassemblies were cleaned.
  - JUNE 29-July 8, 1981: SCA run #6; 9 subassemblies were cleaned.
  - JULY 9-16, 1981: SCA run # 7; 19 filter/particle traps were cleaned.
  - JULY 16-23, 1981: SCA run # 8; 9 subassemblies were cleaned.
  - JULY 25, 1981: SCA run #9; 3 subassemblies were cleaned.
  - JULY 26-AUG.3, 1981 SCA run #10; 9 subassemblies cleaned.
  - AUGUST 4-10, 1981: SCA run #11; 19 filter/particle traps were cleaned.
  - AUGUST 10-17, 1981: SCA run #12; 9 subassemblies cleaned.
  - SEPTEMBER 2, 1981: decontamination solution put into the reaction vessel.
  - SEPTEMBER 4, 1981: demineralized water added to the reaction vessel.
- (a) please note, the dates not shown had no activity.

- SEPTEMBER 3, 1981: added water to reaction vessel.
- SEPTEMBER 9, 1981: emptied decon solution from reaction vessel and rinsed.
- SEPTEMBER 10-17, 1981: SCA run #13; 11 subassemblies cleaned.
- SEPTEMBER 17-23, 1981: SCA run #14; 18 filter/particle traps cleaned.
- SEPTEMBER 23-29, 1981: SCA run #15; 12 filter/particle traps cleaned.
- NOVEMBER 2-25, 1981: decontamination feature test run.
- • FEBRUARY 3-4, 1982: loaded Lithium target assembly into pilot plant.
- APRIL 13-15, 1982: cleaned 9 encapsulated fuel pins.
- MAY 18-21, 1982: cleaned CLEM grapple.
- MAY 24-JUNE 2, 1982: disposal of contaminated NaK.
- JULY 21-AUG.13, 1982: decontamination run demonstration test-III.
- SEPTEMBER 24-Oct.26, 1982: cleaning of a collection of sodium wetted parts.
- OCT. 28-NOV. 19, 1982: cleaned core components grapple.
- MARCH 15-APRIL 11, 1983: oxygen meter calibration studies.
- SEPTEMBER 23-30, 1983: reacted slightly radioactive sodium in can with oil circulating to cool block.
- SEPTEMBER 30-OCT.3, 1983: processed Oak Ridge contaminated sodium.
- OCTOBER 3-31, 1983: no work in the sodium pilot plant.